December 10, 1863.

Major-General SABINE, President, in the Chair.

The President announced that he had appointed the following Members of the Council to be Vice-Presidents :—

The Treasurer.
Dr. Falconer.
Dr. Hooker.
Professor Wheatstone.
The Rev. Professor Willis.

The Very Reverend Dr. Stanley, Dean of Westminster, was admitted into the Society.

The following communications were read :—

I. "On the Spectra of some of the Chemical Elements." By WILLIAM HUGGINS, Esq., F.R.A.S. Communicated by Dr. W. A. MILLER, V.P. and Treas. R.S. Received November 5, 1863.

(Abstract.)

The author has been engaged for some time in association with Prof. W. A. Miller in observing the spectra of the fixed stars. For the purpose of comparing the spectra of these with the spectra of the terrestrial elements, no maps of the latter were found that were conveniently available. Kirchhoff's maps and tables, besides their partial incompleteness, were not suited for night work when the sun could not be simultaneously observed.

The author adopts the lines of the spectrum of common air as the fiducial points of a standard scale to which the spectra of the elements are referred. The air-spectrum has the advantage of being always visible with the spectra of the metals without increased complication of apparatus.

The observations were made with a spectroscope of six prisms of heavy glass of large size. The total deviation of the light with this train of prisms is for the *D* ray about 198°. The telescope and the collimator have both an aperture of 1·7 inch. The focal length of the telescope is 16·5 inches. The measures were partly taken from the readings of a finely divided arc of brass, which the arm carrying the telescope traverses, and partly from the readings of a wire micrometer attached to the eye-end of the telescope. The scale of measurement adopted gives five divisions for the interval between the components of the double line D. The excellent performance of this instrument is shown by the great distinctness of the finer lines of the solar spectrum. All those mapped by Kirchhoff are seen, and many others in addition to these.

The spark of an induction coil was employed, into the secondary circuit

of which a battery of nine Leyden jars was introduced. The Leyden jars are arranged in three batteries of three jars each, and the batteries connected in series.

The relative intensities and distinctive characters of the lines are represented by figures and letters, placed against the numbers in the Tables.

The spectrum, which extends from *a* to *H*, is divided, and forms two maps. The air-spectrum and the principal solar lines are placed at the top of each map, and below these the spectra of the following metals:—Sodium, potassium, calcium, barium, strontium, manganese, thallium, silver, tellurium, tin, iron, cadmium, antimony, gold, bismuth, mercury, cobalt, arsenic, lead, zinc, chromium, osmium, palladium, and platinum.

The lines of the air-spectrum are referred to the components of air to which they severally belong. An unexpected result was observed: two strong lines of the air-spectrum, one of them a double line, were seen to be common to the spectra of oxygen and nitrogen. These gases were obtained from different sources with identical results. The strong red line of the air-spectrum is shown to be due to the presence of aqueous vapour, and to coincide with the line of hydrogen. The carbonic acid in the air is not revealed by spectrum analysis.

Three pairs of lines and one band of haze are given in the sodium spectrum in addition to the double D line. As these might be due to impurities of the commercial sodium employed, the observation was confirmed by an amalgam of sodium prepared by the voltaic method from pure chloride of sodium. Two of these pairs of lines have been recognized in the spectrum of a saturated solution of pure nitrate of soda.

The two stronger pairs appear to agree in position with solar lines having the following numbers in Kirchhoff's scale:—864·4 and 867·1, and 1150·2 and 1154·2.

The spectrum from electrodes of potassium contains many new lines. For the spectra of calcium, lithium, and strontium, metallic calcium, lithium, and strontium were employed.

Barium was mapped from an amalgam of barium prepared by electricity from chloride of barium.

The following metals were employed in the form of electro-deposits upon platinum:—manganese, silver, tin, iron, cadmium, antimony, bismuth, cobalt, lead, zinc, and chromium. Care was taken that the other metals should be reliable for purity.

II. "On the Acids derivable from the Cyanides of the Oxy-radicals of the Di- and Tri-atomic Alcohols." By Maxwell Simpson, A.B., M.B., F.R.S. Received November 7, 1863.

From every glycol it is possible to obtain two radicals—one monatomic, the other diatomic. From every glycerine it is possible to obtain three